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FLOOD INSURANCE STUDY

TOWNSHIP OF CALN, PENNSYLVANIA
CHESTER COUNTY

MAY 17, 1988

Federal Emergency Management Agency

COMMUNITY NUMBER 422247

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PUBLISHED SEPARATELY:

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
TOWNSHIP OF CALN, PENNSYLVANIA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Township of Caln, Chester County, Pennsylvania, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert Caln to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these federally-supported studies are based. These criteria take precedence over the minimum federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3. In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were prepared by A. W. Martin Associates, Inc., for the Federal Insurance Administration, under Contract No. H-4769. This work was completed in October 1979.

1.3 Coordination

In March 1978, streams requiring detailed study were identified at an initial Consultation and Coordination Officer's (CCO) meeting attended by representatives of the FIA, the Township of Caln, and A. W. Martin Associates, Inc. (the study contractor). The results of the hydrologic analyses were coordinated with the Delaware River Basin Commission, the U. S. Geological Survey (USGS), and the U. S. Army Corps of Engineers (COE).

The completed study was coordinated with local officials. On July 9, 1980, a final CCO meeting was held with representatives of the FIA, the township, and the study contractor to review the results of the study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Township of Caln, Chester County, Pennsylvania. The area of study is shown on the Vicinity Map (Figure 1).

East Branch Brandywine Creek, Beaver Creek from approximately 240 feet downstream of U. S. Route 30 to a point approximately 100 feet downstream of Lloyd Avenue, and Valley Run from a point approximately 1,000 feet upstream of Seltzer Road to the confluence with Beaver Creek were studied by detailed methods. The areas studied by detailed methods were selected with priority given to all known flood hazard areas and areas of projected development and proposed construction for the next five years, through October 1984.

The remaining portions of Beaver Creek and Valley Run within the corporate limits were studied by approximate methods. Approximate methods of analysis were used to study those areas having low development potential and minimal flood hazards as identified at the initiation of the study. The scope and methods of study were proposed to and agreed upon by the FIA.

2.2 Community Description

The Township of Caln is located in the central portion of Chester County in southeastern Pennsylvania. It is bordered by the Townships of East and West Brandywine to the north, the Boroughs of Coatesville and South Coatesville to the west, the Townships of East Fallowfield and West Bradford to the south, and the Borough of Downingtown and the Townships of Uwchlan and East Caln to the east. Caln is approximately 30 miles west of the City of Philadelphia. The township had a population of 6,689 in 1970.

The climate of Caln is considered modified humid continental. Annual temperatures average 53 degrees Fahrenheit (°F), and extremes below 9°F and above 100°F are rare. The average annual precipitation is 45 inches and is evenly distributed throughout the year.

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF CALN, PA
(CHESTER CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

East Branch Brandywine Creek flows north to south and forms part of the eastern boundary of the township. Little development exists in the eastern end of the township. Most of the developing has taken place in the western portion. The township is served by U. S. Route 322 and State Route 282 to the east, U. S. Route 30 bypass and highway to the north and south, and State Route 340 in the center. Conrail also serves the residents of the township.

2.3 Principal Flood Problems

The Township of Caln is subject to flooding from East Branch Brandywine Creek, Beaver Creek, and Valley Run. East Branch Brandywine Creek at the Route 30 by-pass drains a basin of approximately 63 square miles. For this reason, the stream is subject to flooding from regional rather than local storms. Historically, major floods in the area have been related to hurricanes. The largest floods on the East Branch occurred in 1920, 1942, 1955, 1960, 1971, and 1972. The maximum known flood occurred on August 9, 1942.

Valley Run is highly vulnerable to flooding. Several roads cross Valley Run and are inundated every 3 to 5 years. Several homes on Loomis and Miller Roads have been subject to flooding but damage has been reported as minimal. Several developments are anticipated in the near future on lands adjacent to Valley Run.

Beaver Creek also exceeds the bank elevation every 3 to 5 years. However, most of the land adjacent to the creek is open and, therefore, the flooding does not produce significant damage.

2.4 Flood Protection Measures

Subsequent to the 1955 flood, the Soil Conservation Service prepared a work plan for the Brandywine Creek watershed (References 1, 2, and 3). The plan proposed the eventual construction of ten flood control dams in the upper areas of Brandywine Creek, four on the West Branch and six on the East Branch. Of these, two dams on the East Branch have been completed to date (PA 431 and PA 437), and two more are under construction (PA 433 and PA 432). The effects of these flood control works are included in the flood analyses. The additional seven structures are awaiting environmental evaluation and final planning. It is not anticipated that any of these structures will be completed within the next two years, hence, their effects on the floods were not calculated.

Interim flood plain zoning regulations are in effect in the township. However, these regulations were developed utilizing limited hydrologic

data. The revisions, therefore, do not significantly restrict future development in flood-prone areas.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one-percent chance of annual occurrence) in any 50-year period is 40 percent (four in ten); and, for any 90-year period, the risk is increased to about 60 percent (six in ten). The analyses reported here reflect flooding potential based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

Natural flood flow frequency data of East Branch Brandywine Creek and Beaver Creek were derived from local generalized frequency curves based on the statistical analysis of stream flow records from 15 gages located in the area and operated by the USGS. The analysis of each gage followed the standard log-Pearson Type III statistical technique recommended by the Water Resources Council (Reference 4). Results were regionalized through a linear regression analysis of the log-log relationships for peak flow versus drainage area for all gages at each return interval.

The natural flood flows determined from the regionalized curves were adjusted to reflect the presence of the four Soil Conservation

Service dams through the use of percent drainage area controlled versus percent peak flow reduction relationships developed for each flood frequency of interest. Flood control effects resulting from the three dams previously discussed were used to modify the natural flood flows. Soil Conservation Service data, developed to analyze the effects of all ten dams on Brandywine Creek flooding, provided a basis for the analysis of flood control effects caused by three dams.

The flood-flow frequency data for Valley Run were determined using the soil-cover complex method developed by the Soil Conservation Service (Reference 5). The flood discharges were determined through the derivation of the flood hydrograph from the sub-drainage areas of Valley Run. The individual hydrographs were routed through the watershed and combined to obtain the peak discharge. This methodology was utilized in order to accurately determine the effects of urbanization within the watershed.

A summary of drainage area-peak discharge relationships for the streams studied by detailed methods is shown in Table 1, "Summary of Discharges."

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
EAST BRANCH BRANDYWINE CREEK[1]					
At U. S. Route 30 By-Pass	43.1	3,350	5,800	6,850	9,600
BEAVER CREEK[2]					
At the U. S. Route 30 By-Pass	8.32	1,300	2,100	2,550	3,300
At the confluence with Valley Run	13.99	2,000	3,300	3,450	5,200
At the Downingtown border	19.0	2,500	4,100	4,900	6,600
VALLEY RUN					
At Seltzer Avenue	1.0	860	1,180	1,380	1,800
At Barley Sheaf Road	2.0	1,260	1,750	2,050	2,700
At Bondsville Road	4.95	2,130	2,950	3,400	4,600

[1]Regulated by three SCS dams
[2]Regulated by SCS dams

3.2 Hydraulic Analysis

Analysis of the hydraulic characteristics of the flooding source studied in detail were carried out to provide estimates of the elevations of floods of the selected recurrence intervals within the limits of the flooding sources.

Water-surface elevations of floods of the selected recurrence intervals were computed for East Branch Brandywine Creek through the use of the Soil Conservation Service WSP-2 step-backwater computer program (References 6 and 7). A hydraulic WSP-2 model of the East Branch within Caln had been developed for the Township of East Caln Flood Insurance Study (Reference 8). East Branch Brandywine Creek is the common boundary between Caln and East Caln. The hydraulic model was utilized with the flood flow rates revised to reflect the Soil Conservation Service flood control dams. Starting water-surface elevations for the East Branch were determined using the slope/area method. Cross sections for the East Branch were obtained from the East Caln study (Reference 8).

Water-surface elevations of floods of the selected recurrence intervals were computed for Beaver Creek and Valley Run through the use of COE HEC-2 step-backwater computer program (Reference 5). Cross sections of the two streams were determined from aerial photogrammetry and land surveys (Reference 10). Starting water-surface elevations for Beaver Creek were obtained from the Flood Insurance Study for the Borough of Downingtown (Reference 11). Starting water-surface elevations for Valley Run were taken from the Beaver Creek elevations. All bridges and culverts were field surveyed to obtain dam data and structural geometry.

Channel roughness factors (Manning's "n") for flood computations were assigned on the basis of field inspection of flood plain areas and on a previous study by the COE (Reference 12). The channel "n" value for East Brandywine Creek was 0.050, and the overbank "n" values ranged from 0.055 to 0.080. For Beaver Creek, the channel "n" value was 0.045, and the overbank "n" values ranged from 0.060 to 0.070. For Valley Run the channel "n" values ranged from 0.030 to 0.060, and the overbank "n" values ranged from 0.050 to 0.070.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals. Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 3). For stream segments for which a floodway is computed (Section 4.2), selected cross-section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

All elevations used in this study are referenced to the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Sea Level Datum of 1929. Locations of the elevation reference marks used in the study are shown on the maps.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are valid only if hydraulic structures remain unobstructed, and dams and other flood control structures operate properly and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:2,400 with a contour interval of 10 feet (Reference 10). In cases where the 100- and 500-year flood boundaries are close together, only the 100-year boundary has been shown.

For the streams studied by approximate methods, the boundary of the 100-year flood was developed through engineering judgment and delineated using USGS flood-prone area maps, the Flood Hazard Boundary Map for Caln, and field inspections (References 14 and 14).

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations and, therefore, may not be subject to flooding. Owing to limitations of the map scale and lack of detailed topographic data, such areas are not shown.

4.2

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
East Branch Brandywine Creek								
A	9.34[1]	309/280[4]	2,084	3.3	245.7	245.7	246.5	0.8
Beaver Creek								
A	4,315[2]	380	1,489	3.0	254.8	254.8	255.2	0.4
B	6,225[2]	400	972	4.5	257.6	257.6	258.0	0.4
C	7,315[2]	200	556	4.9	260.9	260.9	261.5	0.6
D	9,415[2]	200	482	5.6	273.3	273.3	274.3	1.0
Valley Run								
A	1,100[3]	290	1,015	3.4	264.1	264.1	264.9	0.8
B	3,420[3]	185	611	5.6	276.0	276.0	276.6	0.6
C	4,580[3]	260	1,194	2.5	283.5	283.5	284.4	0.9
D	5,900[3]	164	714	4.0	290.1	290.1	290.1	0.0
E	6,691[3]	230	976	2.9	295.4	295.4	296.4	1.0
F	7,920[3]	174	708	3.8	299.8	299.8	300.0	0.2
G	8,935[3]	247	930	2.9	304.2	304.2	304.6	0.4
H	10,485[3]	171	896	2.6	311.9	311.9	312.7	0.8
I	11,485[3]	106	274	8.6	317.4	317.4	317.9	0.5
J	12,505[3]	300	763	2.8	321.9	321.9	322.1	0.2
K	13,785[3]	245	636	3.3	327.8	327.8	328.4	0.6
L	14,705[3]	175	381	4.1	336.2	336.2	337.0	0.8

[1]Miles above confluence with West Branch Brandywine Creek
[2]Feet above corporate limits
[3]Feet above confluence with Beaver Creek
[4]Width/width within corporate limits

TABLE 2

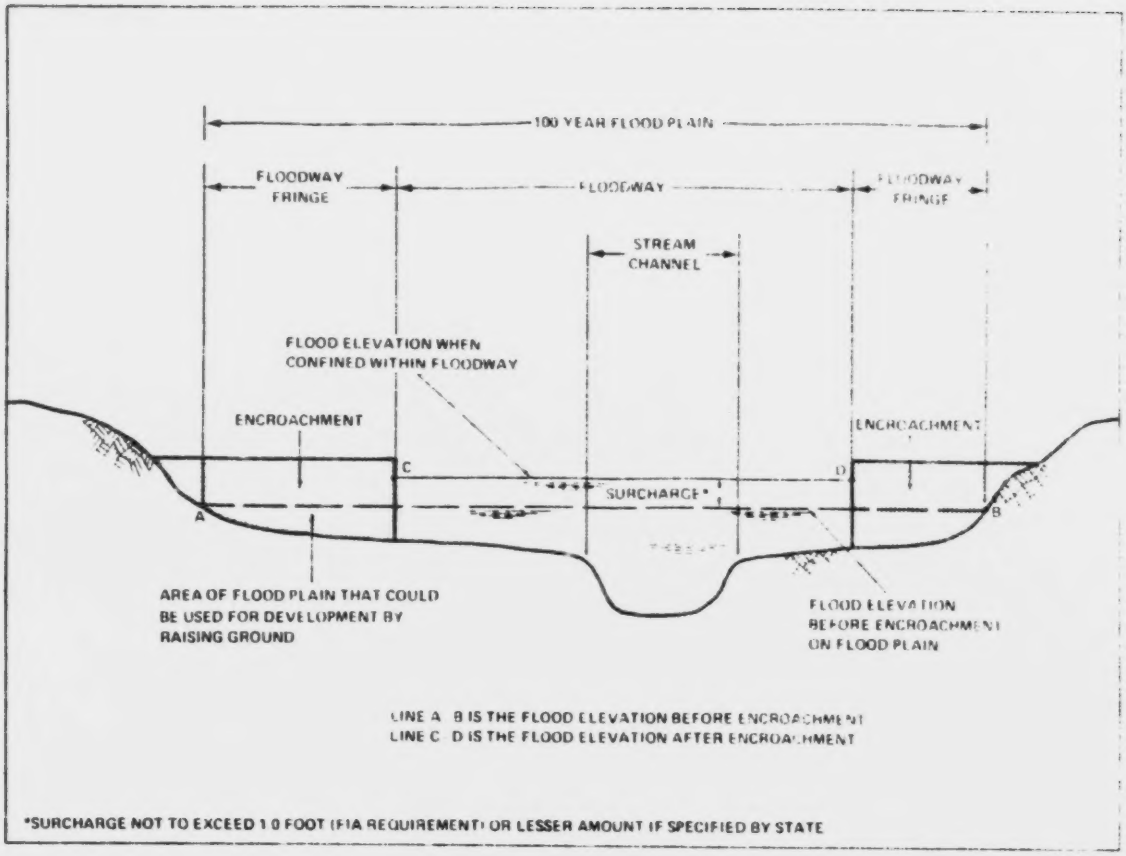
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CALN, PA

(CHESTER CO.)

FLOODWAY DATA

EAST BRANCH BRANDYWINE CREEK- BEAVER CREEK- VALLEY RUN


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FLOODWAY SCHEMATIC Figure 2

insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each flooding source affecting the Township of Caln.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding sources of the Township of Caln are shown on the Flood Profiles (Exhibit 1) and are summarized in the Flood Insurance Zone Data Table (Table 3).

5.2 Flood Hazard Factors

The FHF is the FIA device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Township of Caln was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.
Zones A1, A2, and A3:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also, areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
East Branch Brandywine Creek Reach 1	10	-1.6	-0.5	+0.7	015	A3	Varies
Beaver Creek Reach 1	10	-1.0	-0.3	+0.5	010	A2	Varies
Valley Run Reach 1	10	-0.5	-0.2	+0.4	005	A1	Varies

[1] Flood Insurance Rate Map Panel

[2] Weighted Average

[3] [illegible]

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF CALN, PA
(CHESTER CO.)

FLOOD INSURANCE ZONE DATA

EAST BRANCH BRANDYWINE CREEK, BEAVER CREEK AND VALLEY RUN

Zone B: (continued) subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.

Zone C: Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for the flooding sources studied in detail in the Township of Caln.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Township of Caln is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

The portion of East Branch Brandywine Creek in the Township of Caln was also covered in the Flood Insurance Study for the Township of East Caln (Reference 8). That study did not include the effect of one flood control dam within the watershed and, therefore, reconciliation of data was not required. The profile of Beaver Creek in Caln matches exactly the downstream profile included in the Flood Insurance Study for the Borough of Downingtown (Reference 11).

This study is authoritative for purposes of the Flood Insurance Program, and the data presented here either supersede or are compatible with previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Insurance and Mitigation Division of the Federal Emergency Management Agency, Regional Director, Region III Office, Curtis Building, Room 700, Sixth and Walnut Streets, Philadelphia, Pennsylvania 19106.

8.0 BIBLIOGRAPHY AND REFERENCES

1. U. S. Department of Agriculture, Soil Conservation Service, Work Plan, Brandywine Creek Watershed, Washington, D. C., April 1962.

2. U. S. Department of Agriculture, Soil Conservation Service, Supplemental Work Plan, Brandywine Creek Watershed, Washington, D. C., May 1966.

3. U. S. Department of Agriculture, Soil Conservation Service, Supplemental Watershed Work Plan No. 2, Brandywine Creek Watershed, Washington, D. C., September 1973.

4. Water Resources Council, "Guidelines for Determining Flood Flow Frequency," Bulletin 17A, Washington, D. C., June 1977.

5. U. S. Department of Agriculture, Soil Conservation Service, National Engineering Handbook, Section 4, Hydrology, Part 4, Channel Routing Methods, Washington, D. C., August 1972.

6. U. S. Department of Agriculture, Soil Conservation Service, Technical Release No. 61, WSP-2 Computer Program, Washington, D. C., May 1976.

7. U. S. Department of Agriculture, Soil Conservation Service, Technical Release No. 64, Floodway Determination Computer Program, Washington, D. C., June 1978.

8. Federal Emergency Management Agency, Federal Insurance Administration, Flood Insurance Study, Township of East Caln, Chester County, Pennsylvania (Unpublished).

9. U. S. Army Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water Surface Profiles, Users Manual, Davis, California, October 1973.

10. Quinn and Associates, Inc., of Horsham, Pennsylvania, Topographic Maps compiled by photogrammetric methods, Scale 1:2,400, Contour Interval 5 Feet: Township of Caln, Chester County, Pennsylvania, December 1978.

11. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, Borough of Downingtown, Chester County, Pennsylvania, Washington, D. C., April 15, 1977.

12. U. S. Army Corps of Engineers, Philadelphia District, Flood Plain Information, East Branch Brandywine Creek, Chester County, Pennsylvania, Philadelphia, Pennsylvania, December 1970.

13. U. S. Department of the Interior, Geological Survey, Maps of Flood-Prone Areas, Scale 1:24,000, Contour Interval 20 Feet: Downingtown, Pennsylvania, 1956, Photorevised 1973.

14. U. S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Township of Caln, Chester County, Pennsylvania, August 14, 1975.

9.0 REVISION DESCRIPTION

9.1 Purpose

The purpose of this revision is to incorporate new and/or revised data into the currently effective Flood Insurance Study for the Township of Caln, Chester County, Pennsylvania. This Revision Description is intended to provide updated information which aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

9.2 Acknowledgments

The hydraulic analyses for this revision were performed by Walter B. Satterthwaite Associates, Inc., in March 1984, and Dewberry & Davis in March 1987. The Federal Emergency Management Agency (FEMA) reviewed and accepted these data for purposes of this revision.

9.3 Scope

This revision incorporated a Letter of Map Revision (LOMR), dated May 15, 1984, which reduced the Base (100-year) Flood Elevations (BFEs) and Special Flood Hazard Area (SFHA), and modified the floodway widths for Beaver Creek. The limits of this revision, as described in the effective LOMR, extend along Beaver Creek from approximately 1,250 feet upstream of the confluence of Valley Run and approximately 800 feet downstream of the U. S. Route 30 access road. The LOMR was based on more detailed topographic mapping that modeled the embankment for an existing stormwater detention basin as a levee. Hydraulic analyses for Beaver Creek were performed by Walter B. Satterthwaite Associates, Inc.

This revision also incorporates revised topographic data from numerous sources within the community for Valley Run. The Base Flood Elevations, Special Flood Hazard Area, and floodway widths were modified due to the revised data. The area revised is from approximately 0.27 mile downstream of Municipal Drive to approximately 0.66 mile upstream of Bailey Road along Valley Run. The hydraulic analysis for Valley Run was prepared by Dewberry & Davis.

The Flood Insurance Rate Map panel 10 and Flood Boundary and Floodway Map panel 10 were updated to include the revised hydraulic data.

9.4 Hydrologic and Hydraulic Analyses

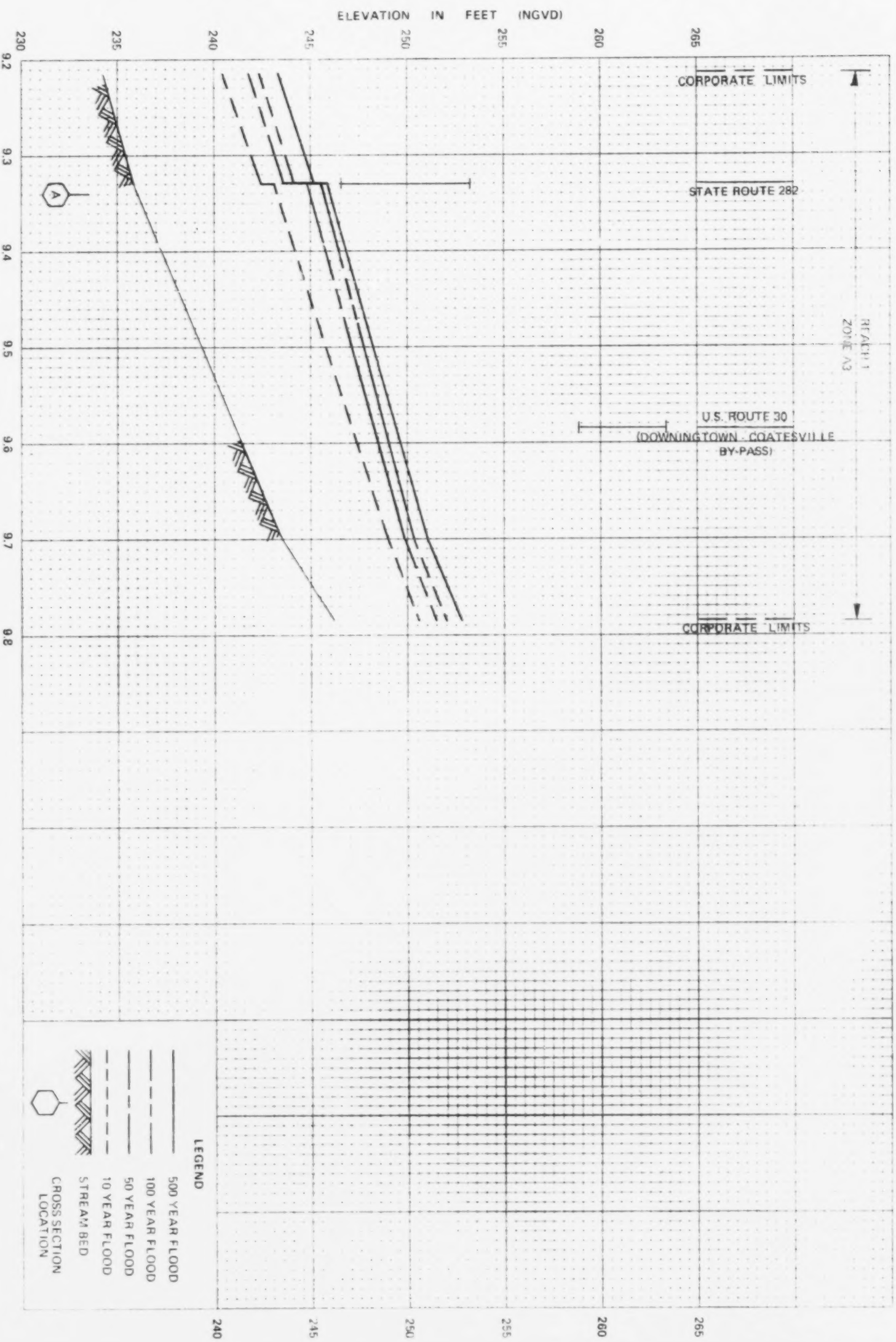
The hydraulic models for Beaver Creek and Valley Run were revised using additional cross sections and updated topographic information. The revised analysis affects panels 02P, 03P, 04P, and 05P of the Flood Profiles.

9.5 Floodways

Floodway computations for Beaver Creek and Valley Run were revised as a result of revised topographic information. The floodway was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for the stream segment for which the floodway was revised and are shown in Table 2, "Floodway Data."

9.6 Location of Data

Information concerning the pertinent data used in preparation of this study can be obtained by contacting FEMA, the Natural and Technological Hazards Division, Liberty Square Building (Second Floor), 105 South Seventh Street, Philadelphia, Pennsylvania 19106.



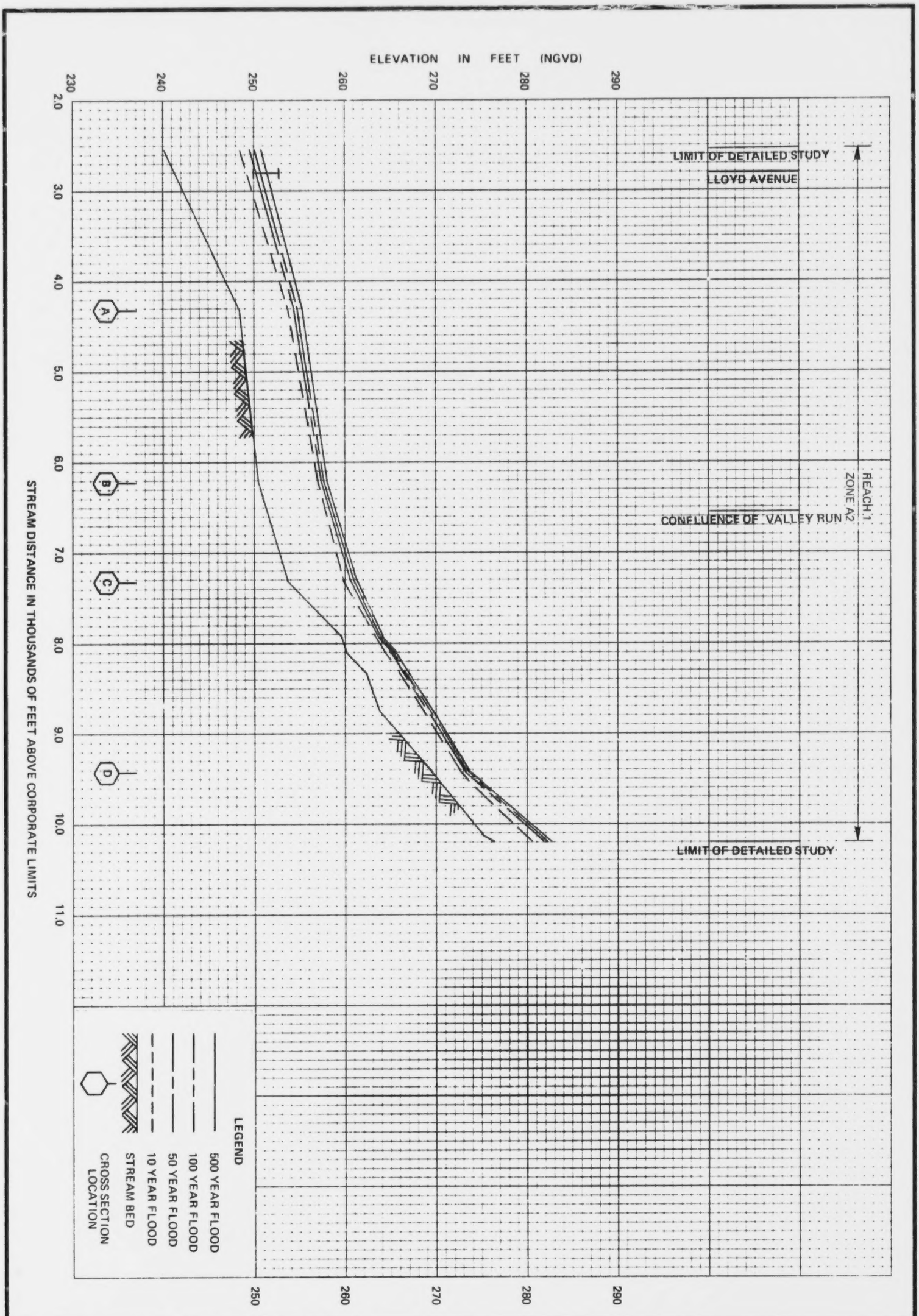
01P

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWNSHIP OF CALN, PA
(CHESTER CO.)

FLOOD PROFILES

EAST BRANCH BRANDYWINE CREEK



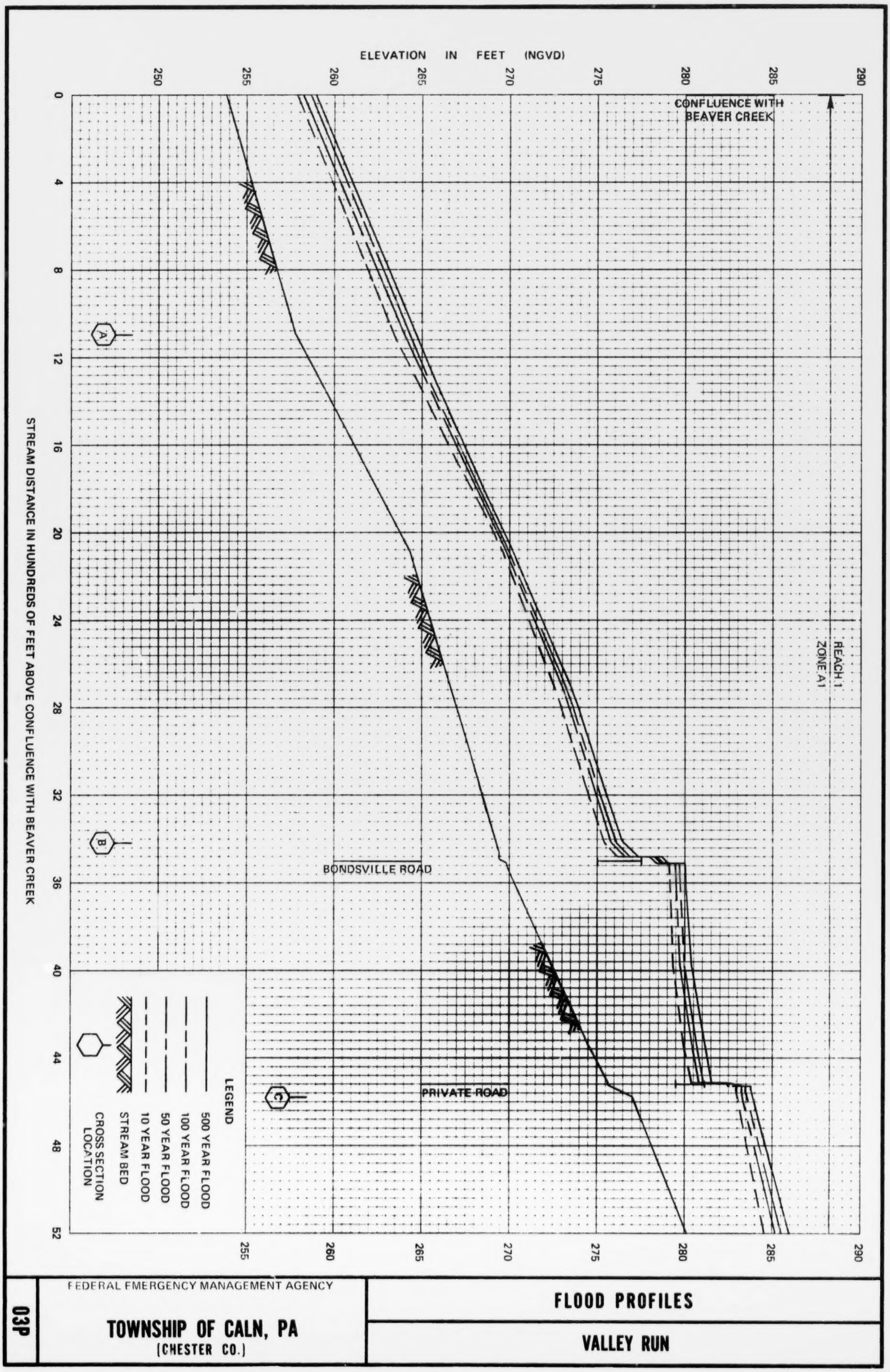
02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CALN, PA
(CHESTER CO.)

FLOOD PROFILES

BEAVER CREEK



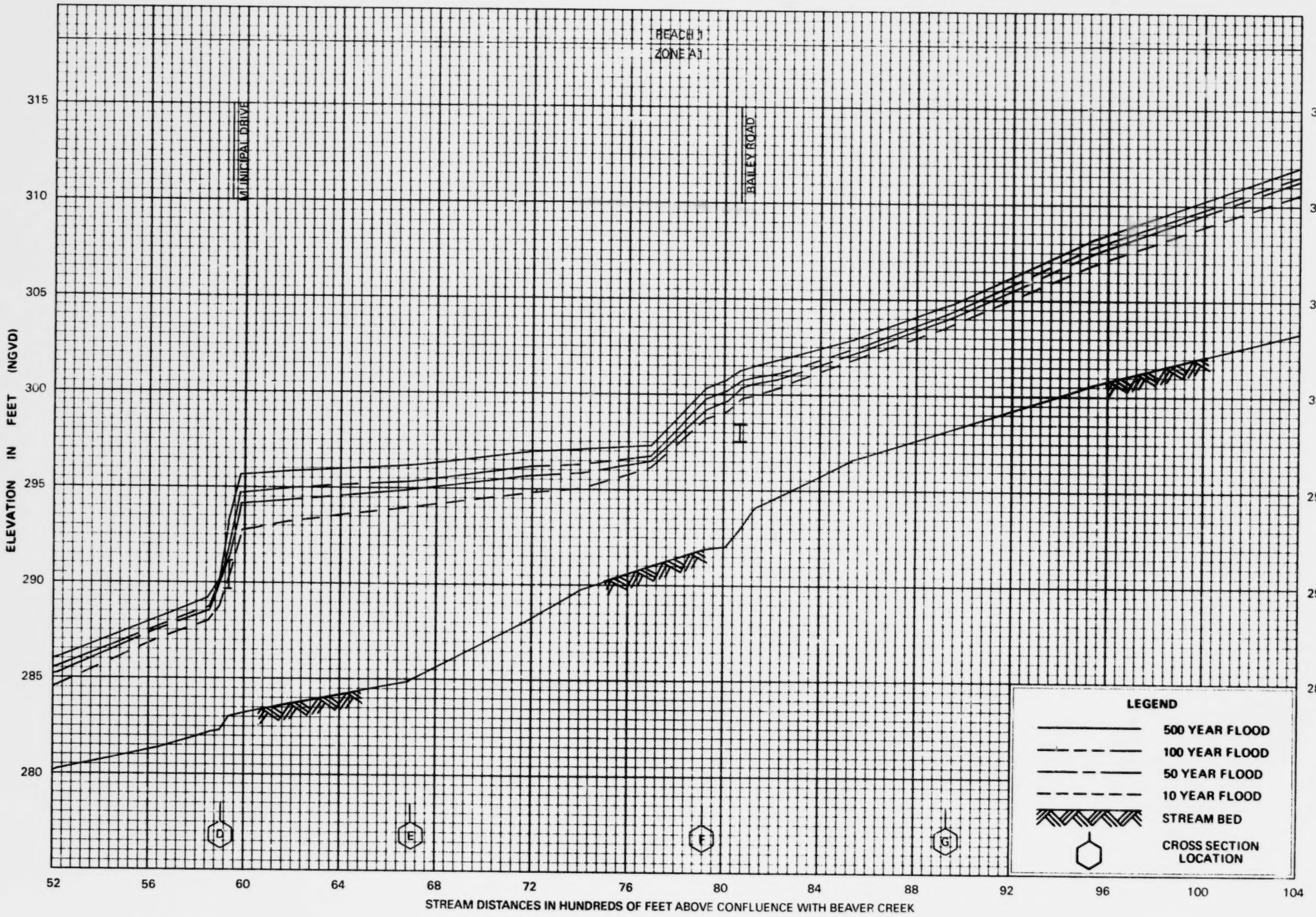
FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CALN, PA
(CHESTER CO.)

FLOOD PROFILES

VALLEY RUN

03P



FLOOD PROFILES

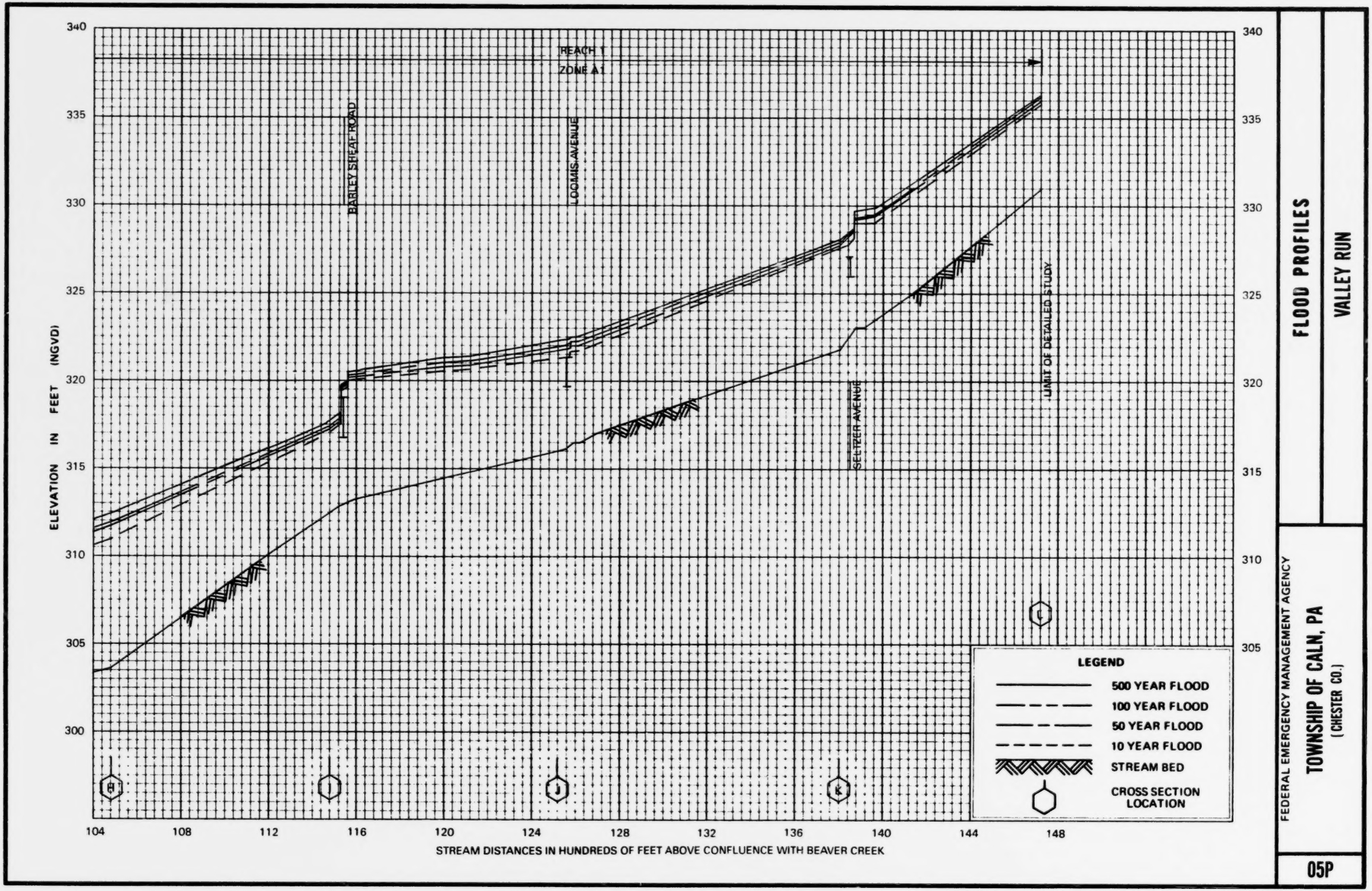
VALLEY RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CALN, PA

(CHESTER CO.)

04P



FLOOD PROFILES

VALLEY RUN

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF CALN, PA

(CHESTER CO.)

05P